

**DEPARTMENT OF AGRICULTURE,
CEYLON.**

BULLETIN No. 37.

**RESULTS OF TEA EXPERIMENTS:
EXPERIMENT STATION, PERADENIYA,
1914—1917.**

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DEPARTMENT OF AGRICULTURE, CEYLON.
BULLETIN No. 37.

PERADENIYA TEA PLOTS.

HE previous Circulars on the tea plots at the Experiment Station, Peradeniya, were published in 1911 and 1914, and this brings the results up to the end of 1917. Some of the plots not under permanent green manures began to show marked deterioration in the wood and frames of the bushes, although yields were fairly maintained. This is specially noticeable in the Manipuri Indigenous plot 148, adjoining the Dadap plot, which had received no green manures for years. Plots 151 to 154 under rubber also fell off rapidly in yield owing to the shade of the latter, and the tea was cut out in August, 1916. In September, 1916, plots 145 and 149 were each treated with 1,000 lb. of well-burned and slaked lime, the lime being broadcasted up every row and lightly forked in. Plots 146 to 148 and 150 each had 500 lb. of lime similarly applied.

Comparing the yields of these plots for 1915 and 1917, the year before and after application of lime and at the same period from pruning, the results are as follows. Plot 145 showed a decrease of 12 lb., and the Dadap plot an increase of 114 lb., due probably to greater amount of organic matter in this plot. Plots 146, 148, and 150 with 500 lb. of lime gave increases of 95, 30, and 85 lb., respectively. As several of the plots had received no special treatment for some years, it was decided to begin annual artificial manuring experiments to test the effect of nitrogen, phosphoric acid, and potash in combination, and of the omission of one constituent in each series.

The experiments began in July, 1917, and the following acre plots were divided into two and manured with mixtures containing one or more of the chief manurial constituents,

20 lb. of each constituent being included. Plots 141 to 143, 146 to 148 Manipuri jât (Norwood), and 155 Assam Hybrid jât, were divided and manured in duplicate :—

Plot 141, A }	286 lb. Groundnut Cake ..	20 lb. Nitrogen.
Plot 146, A }	50 lb. Sulphate of Potash 40 per cent. ..	20 lb. Potash.
Plot 141, B }	286 lb. Groundnut Cake ..	20 lb. Nitrogen.
Plot 146, B }	286 lb. Groundnut Cake ..	20 lb. Nitrogen.
Plot 142, A }	111 lb. Superphosphate ..	20 lb. Phosphoric Acid.
Plot 147, A }	111 lb. Superphosphate ..	20 lb. Phosphoric Acid.
Plot 142, B }	286 lb. Groundnut Cake ..	20 lb. Nitrogen.
Plot 147, B }	286 lb. Groundnut Cake ..	20 lb. Nitrogen.
Plot 143, A }	111 lb. Superphosphate ..	20 lb. Phosphoric Acid.
Plot 148, A }	50 lb. Sulphate of Potash ..	20 lb. Potash.
Plot 143, B }	286 lb. Groundnut Cake ..	20 lb. Nitrogen.
Plot 148, B }	111 lb. Superphosphate ..	20 lb. Phosphoric Acid.
	50 lb. Sulphate of Potash ..	20 lb. Potash.

A census of the bushes in each half-acre plot is being taken, and the yield recorded separately.

The Cora weed (*Cyperus rotunda*) has continued to give trouble, and no method of treatment has so far been completely satisfactory. Constant forking and collecting the roots and liming did good temporarily, but the weed soon returned. An experiment suggested by Mr. Beddewella to sow mustard thickly was tried in plot 155, and is being repeated. The mustard appears to have had no ill-effect on the tea. In Assam it has been found a useful green manure.

In the Dadap plot several bushes also died in the swampy area near the foot of the slope. Couch grass appeared, and was difficult to eradicate.

A new census of bushes has been taken this year, from which the yields for 1917 have been calculated to 2,722 bushes per acre.

The most marked features of the experiments since 1913 are the continued improvement in growth and yield of the original Dadap plot 149, and the plot 144 planted with Dadaps in 1912 in Assam Hybrid tea.

The permanent effect of cattle manure in plot 155 has also been most marked—the last application having been made in March, 1908, when 30 tons per acre were applied. The total actual yield from this plot since 1906 is 8,987 lb., or if calculated to 2,722 bushes per acre 11,379 lb., the area only containing

2,158 bushes. Taking bi-yearly periods since 1906, the cattle manure being applied in 1908, a practically continuous rise in yield is shown to the present time :—

	Actual Yield Made Tea, 2,158 Bushes.	Calculated to 2,722 Bushes. lb.
1906 and 7	292	387
1908 and 9	990	1,139
1910 and 11	1,685	2,175
1912 and 13	1,854	2,618
1914 and 15	1,820	2,313
1916 and 17	2,146	2,747

Pruning.—This is done every two years for all the plots, the Singlo and Assam Hybrid jâts being pruned in June, or the south-west monsoon, and the Manipuri Indigenous in December, or early January in the north-east monsoon. One branch has been left in the latter pruning on account of the succeeding dry weather, and removed when the bushes are ready for tipping. It will be noticed that the plots pruned in the south-west monsoon show a greater difference in yield in the pruned and unpruned years than the Manipuri Indigenous plot pruned in January. The wood in the Dadap, Albizzia, and Cattle Manure plots is very good, but some of the others show deterioration, and will require pruning down. All knots are removed as far as possible, and the cuts are made short and clean, leaving 3 inches of good wood.

The recovery generally is normal, taking from 82 to 94 days with the south-west pruning, and was about the same in 1918 for the Manipuri Indigenous, owing to the prolonged drought from January 24 to March 25. No bushes died out, possibly due to the live branch, which continued flushing through the whole season.

Plucking has been as usual to the whole leaf, with the result that at the time of pruning the bushes are full of leaf, giving a large amount of material for mulching and increasing the humus in the soil. The prunings from 20 bushes on the Dadap plot taken from the upper slope were weighed fresh and gave 273 lb., of which 150 lb., or 55 per cent., were woody branches and 123 lb., or 45 per cent., leaves and small twigs. Calculated to 2,722 bushes per acre, the total weight of prunings would be 37,155 lb., or approximately 16·5 tons, of which

7·4 tons are leafy material. This may be compared with a previous experiment on the same plot in December, 1913, when 32,000 lb., or 14·38 tons, of prunings were obtained, of which 5·89 tons were leafy material.

The analyses of the prunings were published in Bulletin No. 9 of May, 1914, and from these figures the amount of nitrogen and mineral matter returned to the soil in the prunings of two years' growth would be approximately as follows, calculated on the actual number of bushes in the plot, viz., 2,114, or 77 per cent., of an acre planted 4 feet by 4 feet :—

	lb.
Nitrogen in fresh leaves and twigs at 1·16 per cent. . .	143·93
Nitrogen in woody material at 48 per cent. . .	78·94
Total Nitrogen . .	<u>222·87</u>

The ash amounts to 2·57 per cent. on the whole prunings, or 741·6 lb. for the plot, containing approximately—

	lb.		lb.
Lime . . .	181·6	Potash . . .	75·7
Magnesia . . .	70·5	Phosphoric Acid . . .	35·6

This is returned to the soil as the prunings decay, none of the wood being removed.

To determine whether nitrogen was lost by the tea leaves drying on the surface, analyses were made of the half-withered leaf, dry leaves one month, and three months old, and gave 1·61, 1·96, and 2·13 per cent., respectively. In addition to the nitrogen in the prunings returned to the soil, there is the amount contained in the Dadap loppings, which weighed 18,051 lb. during the two years 1916 and 1917. This at 0·82 per cent. on the fresh material is 148 lb. of nitrogen returned to the soil for the two years, or with the prunings a total of 371 lb. The weight of tea actually removed in the same period is 2,774 lb., which contains approximately—

	lb.		lb.
Nitrogen . . .	138·7	Potash . . .	83·2
Lime . . .	22·2	Phosphoric Acid . . .	22·2
Magnesia . . .	11·1		

The phosphoric acid is to a large extent replaced by the basic slag, but an excess of 53 lb. of potash is removed from the soil over the amount supplied in the pruning mixture.

The continued increase of crop from this plot and the fine condition of the bushes tend to show that potash in excess is not required, and that the more vigorous growth enables the roots to obtain sufficient from the soil and the decaying prunings forked in the alternate lines.

The total weight of green material obtained from the Dadaps since 1904 was 127,091 lb., containing approximately 1,074 lb. of nitrogen, worth about Rs. 559 at 52 cents per lb. The average annual quantity is 9,622 lb., containing 82·6 lb. nitrogen. The total yield of tea from the Dadap plot during the same period 1906 to 1917 is 12,875 lb., containing about 644 lb. of nitrogen, leaving a surplus in the soil and bushes of 130 lb. Although equally satisfactory results could probably not be obtained on a large scale on estates, the advantages and economy of green manuring with Dadap on suitable soil and climate is fully demonstrated, and so far it would appear that permanent improvement is being effected at a minimum cost.

Presuming that only 50 per cent. of the Dadap nitrogen is obtained from the air, the nitrogen gained to the soil would be worth about Rs. 48·50 per acre every two years, while to apply the whole of the nitrogen in the Dadap loppings and prunings as groundnut cake would cost Rs. 259.

Comparing plot 146 (with no green manure) and plot 149 Dadaps, and plot 150 Albizzia, the total yields since 1906 are :—

	Plot 146. No Green Manure.	Plot 149. Dadaps.	Plot 150. Albizzia.
	lb.	lb.	lb.
Made tea, 1906 to 1917 ..	10,076 ..	12,875 ..	13,584 ..
Increase ..	— ..	2,799 ..	3,508 ..

As the Albizzia plot is considerably over one acre and contains 3,094 bushes, against 2,114 bushes in 149 and 2,315 bushes in 146, comparison can only be made by calculating to a standard of 2,722 bushes per acre (planted 4 feet by 4 feet).

	Plot 146. lb.	Plot 149. lb.	Plot 150. lb.
Total yields, 1906 to 1917 ..	11,965 ..	16,160 ..	11,826 ..
Average for twelve years ..	997 ..	1,346 ..	985 ..

This shows an average annual increase of 349 lb. per acre on the Dadap plot. The cost of the basic slag and sulphate of potash applied at each pruning (two years) was approximately Rs. 10·30 per acre, or Rs. 62 for the twelve years.

With the cost of forking and application at Rs. 4·70 per acre and three loppings at Re. 1·10, the average cost of cultivation would be approximately Rs. 8 per acre per annum.

Similar experiments with the prunings were made on the Albizia plot, No. 150, twenty bushes being used on the steep area and twenty on the flat.

The weights obtained were :—

	On Steep Slope. lb.	Per- centage.	On Flat Area. lb.	Per- centage.
Woody branches ..	143 $\frac{1}{2}$..	57 ..	98 ..	55 ..
Leaves and twigs ..	105 $\frac{1}{2}$..	43 ..	78 ..	45 ..
Total ..	249		176	

The average weight of prunings from the whole area of 3,094 bushes would be :—

	lb.
Woody branches ..	18,641
Leaves and twigs ..	14,155
Total weight ..	32,796 or 14·6 tons

The Albizzias planted 25 feet by 25 feet in 1904 at the same time as the Dadaps have yielded 51,228 lb. of green material during twelve years' actual lopping, or an average of only 4,269 lb., supplying about 34 lb. of nitrogen per annum, compared with 9,622 lb. from the Dadap plot, supplying 82·6 lb. of nitrogen per annum.

The total yield of tea from the plot during the same period is 13,484 lb., or 1,123 lb. per annum, but calculated to one acre the average yield is about 985 lb.

Weeding.—This was carried out monthly at a cost of Re. 1·25 per acre.

Diseases.—Shot-hole borer has increased in recent years especially below the jungle in the Dadap and Albizia plots but the proportion of bushes on which branches are destroyed is slight. Experiments on painting the pruned branches with various oil and soap emulsions have been begun.

Census of bushes.—The present census of bushes for the plots for 1918 is as follows :—

Plot 141, A ..	935 }	1,900 Singlo Indigenous	.. Artificials
Plot 141, B ..	965 }		
Plot 142, A ..	989 }	2,054 Singlo Indigenous	.. Artificials
Plot 142, B ..	1,065 }		
Plot 143, A ..	955 }	1,838 Singlo Indigenous	.. Artificials
Plot 143, B ..	883 }		
Plot 144 ..	2,286	Assam Hybrid	.. Dadaps
Plot 145 ..	2,460	Assam Hybrid	.. Control
Plot 146, A ..	1,153 }	2,315 Manipuri Indigenous	.. Artificials
Plot 146, B ..	1,162 }		
Plot 147, A ..	1,024 }	2,167 Manipuri Indigenous	.. Artificials
Plot 147, B ..	1,143 }		
Plot 148, A ..	1,009 }	2,168 Manipuri Indigenous	.. Artificials
Plot 148, B ..	1,159 }		
Plot 149 ..	2,114	. Manipuri Indigenous	.. Dadaps
Plot 150 ..	3,094	. Manipuri Indigenous	.. Albizzias
Plot 155, A ..	1,144 }	2,158 Assam Hybrid	.. Cattle Manure
Plot 155, B ..	1,014 }		

Rainfall.—The following table gives details regarding rainfall during the four years 1914 to 1917 :—

Table showing the Monthly Rainfall and number of Wet Days from 1914 to 1917, inclusive.

	1914.		1915.		1916.		1917.	
	Inches.	Wet Days.						
Jan.	2.20	8	9.40	14	.49	2	5.83	12
Feb.	.0.33	3	4.17	3	—	—	6.12	13
March	4.56	10	1.85	6	10.64	13	6.49	17
April	5.87	11	5.57	9	8.10	9	2.15	6
May	4.83	10	2.76	8	7.30	10	4.63	3
June	12.47	27	9.10	13	13.67	20	10.24	14
July	5.17	17	12.84	20	12.53	26	6.40	13
August	5.71	11	5.10	13	4.69	16	9.95	15
Sept.	7.60	16	10.07	16	6.67	16	15.04	19
Oct.	11.87	25	5.88	10	6.77	19	9.63	13
Nov.	7.41	19	12.21	27	9.16	14	16.49	18
Dec.	14.70	21	8.64	14	4.04	10	6.49	13
Total	82.72	178	87.59	153	84.06	155	99.46	166

April 30, 1918.

M. KELWAY BAMBER.

TABLES GIVING DETAILS OF YIELDS.
Actual Yield of Green Leaf per Plot during 1914, 1915, 1916, and 1917.

Year.	141.	142.	143.	144.	145.	146.	147.	148.	149.	150.	151.	152.	153.	154.	155.	Total.	
	Singlo	Indigenous.		Assam (Horsagala).		Manipuri	Indigenous (Kotiyagala and Norwood).										
1914	..	3200	3733	3075	4391	5256	4131	4004	3947	5108	5096	2296	2131	2485	2306	5257	56415
1915	..	1790	1864	1725	2801	3057	4655	4273	3752	6270	5756	1082	1012	118	1129	2269	42864
1916	..	3283	4014	3336	4563	5280	3918	3954	3405	4720	5086	1084	970	878	836	5340	50866
1917	..	2028	2242	2067	3140	3016	5926	4996	3894	6761	1127	—	—	—	3548	42835	

Yields of made Tea during the Years 1914, 1915, 1916, and 1917, made Tea being estimated at 24·15 Per Cent. of the Fresh Leaf.

Year.	141.	142.	143.	144.	145.	146.	147.	148.	149.	150.	151.	152.	153.	154.	155.	Total.	
	Mixed Manure	Soluble Manure	Mixed Manure	Planted Plot.	Burned.	Pruned.	Dried	Cultivated.	Cultivated.	Dashed Plot.	Cultivated.	Albizia Plot.	Cultivated.	Cultivated.	Cultivated.	Rate per Mann.	
1914	..	774	900	743	1060	1269	1000	968	951	1236	1226	552	515	600	556	1271	82·72
1915	..	432	452	417	701	740	1118	1034	910	1518	1394	248	245	270	267	5449	87·58
1916	..	792	970	814	1105	1272	940	950	824	1142	1128	205	234	212	216	1290	84·06
1917	..	430	545	400	758	1213	1105	940	1032	1479	1479	—	—	—	—	866	80·46

Yields of made Tea during the Years 1914, 1915, 1916, and 1917, calculated to 2,722 Bushes per
Acre, planted 4 feet by 4 feet.

Year.	No. of Bushes	141.	142.	143.	144.	145.	146.	147.	148.	149.	150.	151.	152.	153.	154.	155.	Hempill Manure.
		Dated, 1912.	Dated, 1913.	Dated, 1914.	Dated, 1915.	Dated, 1916.	Dated, 1917.	Crotalaria.	Crotalaria.	Crotalaria.	Crotalaria.	Athizzia Plot.	Crotalaria, 1910.	Athizzia Plot.	Crotalaria, 1910.	Athizzia Plot.	
1914	1102	1339	1075	1655	1344	1186	1261	1265	1576	1068	916	83	1154	984	1644	8272	
1915	..	615	672	604	1026	784	1326	1347	1210	1938	1216	411	398	619	472	710	
1916	..	1127	1443	1178	1617	1347	1115	1237	1098	1458	1070	439	380	407	382	1668	
1917	..	702	722	738	902	806	1426	1389	1180	2101	1301	—	—	—	—	1079	
																1079	

Table showing the Monthly Yield of Green Leaf; Number of Bushes in Bearing; and Dates of Pruning, Tipping, and Manuring in each Plot.

Table showing the Monthly Yield of Green Leaf; Number of Bushes in Bearing; and Dates of Pruning, Tipping, and Manuring in each Plot.
1915.

Number of Plot J..	141.	142.	143.	144.	145.	146.	147.	148.	149.	150.	151.	152.	153.	154.	155.	Rainfall.	
	Singlo Indigenous.																
J.S. of Bushes J..																	
Bushes In Bearing :—	1612	1839	1850	1850	2356	2356	2294	2082	2046	2152	8122	1612	1612	1415	1658	2104	
1912 ..	1670	2004	1867	2256	2592	2245	2157	2239	3137	1823	1779	1804	1869	2168	2087	940	
1913 ..																	
January ..	109	121	127	127	247	193	279	240	410	55	53	78	93	278	3087	417	
February ..	143	156	156	156	399	248	558	539	682	513	124	141	133	257	8906	417	
March ..	169	193	146	146	276	206	412	340	465	407	124	144	133	233	8859	185	
April ..	162	180	144	273	266	443	864	593	580	133	124	166	144	4216	557	9	
May ..	247	325	273	644	671	636	548	494	675	640	142	133	147	146	3996	270	
June ..	98	155	161	232	229	871	316	301	428	433	78	99	93	247	3343	13	
July ..	—	—	2	100	227	434	360	314	504	510	29	20	88	66	216	1565	
August ..	139	—	—	—	—	236	286	192	603	587	—	—	—	—	2271	1007	
September ..	159	81	16	19	321	329	329	323	507	521	35	27	24	90	2271	583	
October ..	288	272	383	386	482	386	386	346	662	423	205	86	168	4533	1221	10	
November ..	383	383	373	477	512	321	290	218	623	312	142	140	130	104	289	4617	
December ..																	
Total ..	1700	1866	1725	2901	3057	4616	4274	3752	6270	6780	1022	1012	1118	1129	2260	45588	
Pruned ..	21/6/15	25/6/15	28/6/15	7/7/15	4/1/16	7/1/16	13/1/16	18/1/16	20/1/16	1/7/15	4/7/16	17/7/15	20/7/15	23/7/15	—	—	
Tipped ..	27/9/15	27/9/15	28/9/15	80/9/15	80/9/15	16/3/16	17/3/16	18/3/16	20/3/16	22/3/16	23/8/15	13/10/15	13/10/15	12/8/15	14/8/15	—	—
Manured ..	3/8/15	2/8/15	3/8/15	9/8/15	10/8/15	16/3/16	17/3/16	18/3/16	19/3/16	20/3/16	21/8/15	6/8/15	11/8/15	12/8/15	14/8/15	—	—

Table showing the Monthly Yield of Green Leaf, Number of Bushes in Bearing; and Dates of Pruning, Tipping, and Manuring in each Plot.

1916.

Number of Plot } ..	141.	142.	143.	144.	145.	146.	147.	148.	149.	150.	151.	152.	153.	154.	155.	Rainfall. Total.	
																Days. Hrs.	
Jkt. of Bushes } ..																	
Bushes In Bearing } ..	1912	1820	1880	1859	2569	2204	2080	2046	2132	1642	1972	1415	1538	2104	2158		
Bushes In Bearing } ..	1913	2004	1887	2205	2592	2245	2082	2167	2239	1633	1770	1964	1889	2104	2158		
January ..	113	185	148	210	195	174	140	820	105	102	64	138	121	356	2407	-49	
February ..	228	225	161	184	231	162	146	830	82	123	121	135	123	352	2407	2	
March ..	329	240	229	304	1394	1261	106	182	163	163	163	163	163	3915	10/14		
April ..	379	607	894	631	691	204	207	203	3083	323	208	147	147	147	3915	10/14	13
May ..	323	650	469	554	860	194	193	201	235	233	162	144	144	144	568	6/14	
June ..	338	965	535	572	539	207	347	329	401	396	153	121	132	132	5232	7/30	10
July ..	273	339	409	360	375	575	523	235	362	372	94	87	101	101	515	4/28	13
August ..	333	409	360	561	403	554	473	434	706	74	80	75	73	73	432	5/6	20
September ..	262	307	250	410	217	399	377	459	473	473	633	533	533	533	439	12/53	
October ..	218	269	220	238	366	338	488	603	503	503	621	517	517	517	416	6/14	16
November ..	222	250	217	209	313	339	437	452	604	604	624	—	—	—	315	4/26	6/14
December ..	203	—	—	—	—	—	—	—	—	—	—	—	—	—	479	4/30	4/04
Total ..	3283	4014	3394	4463	5260	3983	3405	4720	5083	1084	970	878	805	53401	40660	34/06	155
Pruned Tipped	..	21/6/15	22/6/15	28/6/15	7/7/15	10/7/15	4/1/16	7/1/16	13/1/16	18/1/16	26/1/16	1/7/16	4/7/16	29/7/16	29/7/16	—	—
Manured	..	27/9/15	28/9/15	38/9/15	30/9/15	30/9/15	10/8/15	10/8/15	10/3/16	17/3/16	18/3/16	20/3/16	22/3/16	28/9/15	29/9/15	10/15	—
	..	31/7/15	2/8/15	3/8/15	3/8/15	3/8/15	9/8/15	9/8/15	10/8/15	10/8/15	10/8/15	10/8/15	10/8/15	6/8/15	6/8/15	11/8/15	14/8/15

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Table showing the Monthly Yield of Green Leaf; Number of Bushes in Bearing; and Dates of Pruning, Tipping, and Manuring in each Plot.

1917.

Number of Plot ..	141.	142.	143.	144.	145.	146.	147.	148.	149.	150.	155.	Rainfall.				
												Assam Hybrid.				
Jat of Bushes ..	Singlo.												Manipuri Indigenous.			
Bushes in Bearing ..	1912	1820	1880	1850	2060	2215	2062	2215	2167	2082	2136	2132	2104	2158	2158	
Bearing ..	1912	1910	1867	1838	2054	2236	2460	2316	2167	2168	2114	2094	2158	2158	2158	
January	122	138	111	187	162	205	256	267	271	329	271	2902	5.83	12	13	
February	177	185	168	292	271	382	404	349	593	486	336	3613	6.12	13	13	
March	284	331	351	513	522	588	544	483	756	719	601	3652	6.49	17	17	
April	239	369	331	610	471	458	513	454	716	639	611	5216	2.15	8	8	
May	232	275	312	419	425	537	537	533	574	521	486	4658	10.34	14	14	
June	130	232	248	418	418	515	515	507	573	463	433	4180	6.40	13	13	
July	—	—	—	—	—	70	338	365	397	468	408	—	2971	9.96	15	15
August	—	—	—	—	—	—	402	402	511	511	498	—	1719	15.04	19	19
September	173	168	115	153	53	322	312	240	487	358	—	2209	9.63	13	13	
October	230	242	188	316	310	287	310	184	608	296	—	3815	10.49	18	18	
November	321	312	253	310	310	306	460	276	503	372	324	302	1113	6.40	12	12
December	—	—	—	—	—	—	—	271	660	394	302	—	—	—	—	—
Total ..	2018	2242	2007	3140	3016	5050	4996	3894	6704	6127	3548	42855	90.46	156	156	
Pruned ..	12/6/17	15/6/17	23/6/17	29/6/17	5/7/17	—	—	—	—	—	—	—	—	—	—	
Tipped ..	14/9/17	17/9/17	18/9/17	19/9/17	28/9/17	—	—	—	—	—	—	—	—	—	—	
Manured ..	9/5/17	13/5/17	13/5/17	—	—	—	—	11/9/17	11/9/17	—	—	—	—	—	—	

(13)

